UPDATE

Every year we re-evaluate and update our current curriculum to maintain the level of excellence in our water unit. New topics, additional ideas, and innovative techniques are tried.

Enclosed with this sheet are a few of the additions and revisions we have made that really worked with our students. Hope they work as well with yours!

Please note that there have also been extensions in topics which are covered by guest speakers. (i.e. protection of watersheds by controlling & treating runoff)

WATER MAIN TAPPING

Byron Center is not large enough to maintain its own employees for maintenance of water services, however many communities in our area do. One of these is Plainfield Township and we were fortunate that they were strong advocates for water education. When we contacted them about the possibility of coming to our school to help us teach our students about their careers and responsibilities, they couldn't believe we actually wanted their help.

We worked with them and developed a 30 minute presentation where they illustrated what service they provided (through use of hand made posters) and then provided our students with a hands-on experience where the students tapped a real piece of pressurized water main.

They brought in two four-foot sections of 4" water main which they pressurized through use of special equipment they had. The students were led through a series of instructions which allowed them to tap a water main to provide an access for an individual home or small business. This not only helped them link the entire picture of water delivery together, but also gave them a hands-on approach to a career available.

SURFACE TENSION

The following sheets on surface tension were used in conjunction with page 82 in the original manual.

PARTS PER MILLION

This lab activity was used to reinforce the standards of water quality referred to on page 60.

TURBIDITY

Students' knowledge of the measuring of suspended particles in water is put to the test in trying to figure out which graduated cylinder represents what body of water.

SCIENCE SATURATION DAY

As we continued to expand our program, we found that there was not enough time to include all of the experiments necessary to make students aware of the many facets of water. Our solution was to dedicate an entire day to science experiments. Students rotated through a schedule which allowed them to complete an experiment in every class.

This not only gave then a greater understanding of the properties of water but also allowed them to see each of their teachers in a different role, that of a science teacher. It has been so successful that we intend to add an experiment involving testing for and removal of hazardous materials from water. This will be related to the nation-wide concern about arsenic in our drinking water.

WEEK	MARCH 12 MONDAY	MARCH 13 TUESDAY	MARCH 14 WEDNESDAY	MARCH 15 THURSDAY	MARCH 16 FRIDAY
1ST HR.	INTRO WATER TASTING	**DRY DOCK**	DRY	DRY	**DRY DOCK**
2ND HR.	5 Gallon Demo. Video: Michigan's Drinking Water	LAKE GROUPS CLASSROOMS WORK ON **Waterfall of Quotations**	DOCK	DOCK	Presentations: GROUP A: Speaker Hydrants, Valves, & Water Towers Rm. 209- Mr. Boss
3RD HR.	Passport/grading	**FISHY FACTS**			GROUP B: Ground Water Pollution Media Center - Mr. Wierzbicki
4TH HR.		**Great Lakes Pattern for WALL**	DAY	TIME	GROUP C: Water Filtration Band Room - Mr. VanDyk
5TH HR.	GROUP I: MEDIA CENTER MR. DERIN MUSIC INTRO.	**Go to 2nd hour for poster contest**		GROUP A: Speaker: Waste water treatment Rm.209 Mrs. Idema	**Lake Groups: Boat Building**
6TH HR.	GROUP II: LOBBY WATER DIVINING	**DRY DOCK**		GROUP B: Water For People Media Center: Mr. Mike Roon	**DRY DOCK**
7TH HR.		**Go to 2nd hour for poster contest**		GROUP C: Regatta Rm. 204 Mr. Streling	**Lake Groups: Boat Building**

WEEK (TWO)	MARCH 19 MONDAY	MARCH 20 TUESDAY SATURATION DAY	MARCH 21 WEDNESDAY	MARCH 22 THURSDAY	MARCH 23 FRIDAY
1ST HR.	DRY	1. Parts per Million Rm. 211- Mr. Krauss	DRY DOCK		FINAL DAY CELEBRATION BREAKFAST
2ND HR.		2. Porosity Rm. 209 - Mrs. Idema	Group A.: Speaker Coast Guard Media Center		REGATTA FINALS gym
3RD HR.	DOCK	3. Surface Tension Rm. 201- Mrs. Howse	Group B: Video Rm 201	FIELD	HYDRANT DEMO.
4TH HR.	TIME	4. Video: National Geographic Water Rm. 204	Group C: Speaker Watershed & Well Head Protection Rm. 209- Mr. Brown	TRIP	VIDEO
5TH HR.	Group A-Speaker Water Main Tapping Bus Garage- Plainfield Township	5. Dew point & Relative Humidity Rm. 205- Mrs. Wauben	DRY	DAY	*LAKE ROOMS* *20,000 Leagues Under the Sea*
6TH HR.	Group B- Speaker Water Quality for Zoo Animals Media Center: Mrs. Dykstra	6. Solubility Rm. 210- Mr. Poterack	DOCK		
7TH HR.	Group C-Speaker Construction Rm. 209: Mr. Dykema	7. Turbidity Rm 202 - Mrs. Spence	TIME		COLLECT PASSPORTS

TURBIDITY EXPERIMENT

The quality of water in the great lakes is measured in several ways. One on these is the turbidity (clarity) of the water. Turbidity is a measure of the suspended particles (organic matter, plankton, algae, microorganisms, etc.) in the water or in other words a measure of the clarity of the water.

In this experiment you will visit sites around the room representing the various lakes we are studying in the water unit. By reading Secchi disks you will determine the turbidity of each body of water. Be sure to answer all of the questions and fill out the chart completely.

To use a Secchi disks, you lower the disk slowly and ***carefully*** into the graduated cylinder until the black and white pattern can no longer be seen. Then raise the disk until the pattern is *just* visible. At this depth, mark the dowel at the water surface, remove the disc and record the distance from the mark to the disk. The deeper the disk can be placed before it can no longer be seen, the clearer the water. Do this twice with each lake sample.

The outside of the cylinders must be completely covered by dark paper to keep light from entering the sides. Remember, light does not enter a lake from the sides or the bottom, only the top.

MAKE A DRAWING OF THE APPARATUS AND SECCHI DISKS

NAME OF LAKE DEPTH (CM.	TRIAL 1 DEPTH (CM.)	TRIAL 2 DEPTH	AVERAGE (CM.)
LAKE MICHIGAN			
LAKE HURON			
LAKE ONTARIO			
LAKE SUPERIOR			
LAKE ERIE			
LAKE ST. CLAIR			
SAGINAW BAY			
ST. LAWRENCE RIVER			

1. Define turbidity.

2. Which of the lakes has the best turbidity level?

3. Rank the bodies of water from most desirable to least desirable in terms of turbidity levels.

4. Name two ways that a lower turbidity level would be helpful.

SURFACE TENSION

Materials Needed: Penny, Dropper, Beaker, 3 Needles, Paper Towel, Glass, Paper Clips

Procedure:

1. Each member of the lab estimate how many drops of water one side of a penny will hold. Record on chart #1.

2. Fill beaker with water and use it to fill eye dropper.

3. Hold eye dropper parallel to the table approximately one inch above penny. Let drops of water fall out slowly, one at a time to see how many drops of water the penny will hold. Record results on chart #1 under "Actual Trial."

4. Wipe penny completely before another lab member applies drops. Repeat step 3 until all members have results for their "Actual Trial" column.

5. Total all "Estimates" to find average, as well as all "Actual Trials."

6. Draw a side view picture of the water on the penny just before it overflowed.

7. If you did the experiment all over again would you PREDICT the same number of drops as you did before?
Why or Why Not?

8. Make a list of "VARIABLES" that could alter the number of drops the penny will hold.

9. Describe a way to change this experiment taking any one of the variables from #8 into account.

PART 2 -

1. Fill glass of water to brim. Draw picture of cup full of water here.

2. Estimate how many paper clips can be placed into cup until it over flows. Record on chart #2.
3. Place paper clips in cup one at a time until the water overflows. Record results on chart #2. Observe the cup and draw a picture of the cup and water just before it runs over.

4. If you had to estimate the number again, would it be the same? Why or why not?

CHART #1

NAME	ESTIMATE	ACTUAL TRIAL
TOTAL		
AVERAGE		

CHART #2

NAME	ESTIMATE	ACTUAL	ERROR
TOTAL			
AVERAGE			

Part 3 -

1. Fill the beaker until you can see the surface of the water crown up above the top of the container. Tell why this happens.

2. Take a steel sewing needle and try to get it to float on the water. (You get 3 needles to accomplish this)

   *Needles must be held between fingers parallel to the surface of the water and dropped gently onto water surface.

3. Show your teacher when you have one needle floating.

4. NOTE: Density of Steel - 7.8 g/ml
   Density of Water - 1.0 g/ml
   Explain why these needles can float.

Name _____ Date _____ Period _____

STUDENT SHEET 2-1

Parts per Million

Questions

1. What is a 10% salt solution? _____

2. How would you produce 50 grams of a 10% salt solution? _____

3. How would you produce, by weight, a 10% solution of food coloring using a powdered dye and water? _____

Materials

For each pair of students:

- CEPUP tray
- Medicine dropper
- White paper

For each group of four students:

One 1 oz dropping bottle of each of the following:

- Food coloring
- Water

Procedure

1. Place a piece of white paper under the CEPUP tray.
2. Put one drop of food coloring into small Cup 1 and Cup 2.
3. To small Cup 2, add 9 drops of water. Mix the solution by drawing it up into the medicine dropper and carefully putting it back into Cup 2 by gently squeezing the bulb. Be sure to squeeze the bulb before putting the dropper tip into the solution.
4. Using the medicine dropper, transfer one drop of the solution in Cup 2 to Cup 3. Return any excess back to Cup 2. Then add 9 drops of water to Cup 3. Use the dropper to,mix the solution in Cup 3 and transfer one drop to Cup 4. Return any excess to Cup 3.
5. Add 9 drops of water to cup 4. Mix. Transfer one drop to cup 5. Add 9 drops of water to cup 5. Mix.
6. Continue the process through Cup 9, taking a drop of the solution from the previous cup and adding 9 drops of water.
7. Record the color of the solution in each cup on the data table.
8. Determine the concentration of the solution for each cup and record it on the data table on the next page.

Data table

Cup	Color	Concentration
1		
2		
3		
4		
5		
6		
7		
8		
9		

9. Check the concentrations for each cup, making sure that each cup is successively diluted by 1/10.

Questions

4. What is the number of the cup in which the solution first appeared colorless? _____

5. What is the concentration in parts of dye per parts of solution in this cup? _____

6. Do you think there is any of the colored solution present in this cup of diluted solution even though it is colorless? Explain. _____

_____

_____

7. Try to think of an experiment you can do with the solutions prepared in this experiment to see what would be left if the water were not present. Do the experiment and record what you observe. _____

_____

_____

_____

_____

_____

CONTAMINANTS IN THE WATER CYCLE

What are you going to do in this activity?

- describe the water cycle;
- answer questions about the EPA's list of water contaminants;
- Sketch fictitious towns, showing the water cycle, contaminants and their sources, and the health effects of these contaminants.

Procedure

1. You are to describe the water cycle, including the processes of evaporation, condensation, and precipitation. Refer to the following Web sites for diagrams:

National Geographic: Geography Action! Rivers 2001
EPA: The Water Cycle at Work

You are to go to this Environmental Protection Agency Web page about drinking water standards. Define the six types of contaminants listed on this page: microorganisms, disinfectants (used to treat drinking water), disinfection byproducts, inorganic chemicals, organic chemicals, and radionuclides (radioactive materials).

You are to look at the list of contaminants under each classification and answer these questions:

2. What chemicals are used to disinfect the water supply? What positive and negative effects can these chemicals have?

3. Is inorganic chemical pollution primarily the result of natural or human-made factors? Name two inorganic chemicals and their potential impacts on human health.

4. What role can agriculture play in water contamination? What are the primary causes of agricultural contamination?

Homework:

You are to sketch a hypothetical town that lie near bodies of water such as rivers, lakes, or the ocean. Your diagrams should show the following things:

- the water cycle;
- the names of at least three pollutants next to the places they come from (for example, a town might have a pulp mill that leaks chromium into a river, which subsequently contaminates the ocean—you would draw the pulp mill and write "chromium" next to it);
- the potential human impacts of these contaminants (you can list these impacts next to the names of the pollutants or at the bottom of their drawings)

You should be creative with your drawings, but you must include at least three pollution sources and show the full water cycle.

Web Sites:

1. water cycle: http://www.nationalgeographic.com/geographyaction/rivers/
2. National Geographic: Geography Action! Rivers 2001 : http://www.nationalgeographic.com/geographyaction/rivers/
3. EPA: The Water Cycle at Work : http://www.epa.gov/safewater/kids/cycle.html
4. drinking water standards: http://www.epa.gov/safewater/mcl.html
5. full water cycle: http://www.epa.gov/safewater/kids/cycle.html

Answer Page

1. You are to describe the water cycle, including the processes of evaporation, condensation, and precipitation. Refer to the following Web sites for diagrams:

Terms:

Microorganisms

Disinfectants (used to treat drinking water)

Disinfection byproducts

Inorganic chemicals

Organic chemicals

Radionuclides (radioactive materials

2. What chemicals are used to disinfect the water supply? What positive and negative effects can these chemicals have?

3. Is inorganic chemical pollution primarily the result of natural or human-made factors? Name two inorganic chemicals and their potential impacts on human health.

4. What role can agriculture play in water contamination? What are the primary causes of agricultural contamination?

Sketch of Water Cycle in Fictitious Town

Teacher's Vocabulary List

Aquifer- large water source located underground

Surface water- water laying on top of the ground (ex. lakes, rivers, ponds)

Coagulation- process by which lime and alum cling to particles in the water

Sedimentation- process by which floc particles settle to the bottom of a large tank or basin

Disinfection- process by which chlorine or other chemicals kill germs

Aeration - process of adding large amounts of air to a mixture of waste water, bacteria, and microorganisms.

Chlorination - process by which chlorine is added to kill germs

CSO - combined sewer overflow

water main - large pipe which carries water to consumers

bay- a arm of a body of water

rapids - swiftly flowing river water

volume- measure of a quantity something can hold

turbidity - muddiness

properties - qualities or characteristics

solvent - a liquid that can dissolve other substances (water is called a universal solvent)

percolation - the process of water moving downward through openings in the soil

evaporation - the proeess in which a liquid becomes a gas

ground water- water under the ground (ex. spring or well)

flocculation- the process where particles stick together to form larger particles called floc

filtration- the process in which particles are removed by passing water through layers of sand and gravel

electrode- one of the terminals of a battery

ground subsidence- an area where too much water has been removed from a aquifer causing the ground to sink

sludge - solid material collected from the primary sedimentation tank

effluent - water that is released from the water treatment plant

water valve - a giant faucet used to control or shut off water in water mains

river mouth - place where a river empties into a larger body of water

river source - place where a river begins

retention basin - temporary storage area needed to hold excess waste water during times of heavy rainfall

dew point - temperature at which air becomes saturated

soluble - able to be mixed with water

relative humidity - comparison of how much water vapor is in the air to how much it could hold if saturated

electrolysis - process used to separate water into elements

saturated - totally full

pollution - anything that causes a substance to become unusable

X regatta- a sail boat race

X characteristics - traits

transportation - system by which water is distributed to consumers

reservoirs- large tanks used for storing water until it is need

distillation- the evaporation of a solvent, transporting it to another place, and condensing it

hydrology- the study of the water cycle

humidity- amount of water in the air

X - OMITS THIS YEAR

SPEAKER FORM

Student Name_____

Lake Name_____

1. Speaker's Name_____

2. Speaker's Topic_____

3. Speaker's Occupation_____

4. Educational background or classes needed for this occupation_____

_____

_____

5. How does this occupation relate to water?_____

_____

MAIN PRESENTATION

6. List 2 interesting facts from the speaker's introduction._____

_____

_____

7. List 2 interesting facts from the middle of the speaker's presentation.

_____

_____

8. List 2 interesting facts from the speaker's conclusion._____

_____

_____

9. What was the main idea of the presentation?_____

_____

_____

10. Name 1 additional fact that you found interesting/surprising

_____

_____